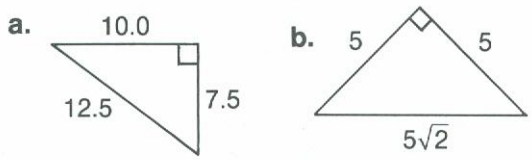
Math 9 Pythagoras Theorem Lesson 3

Journeys Page 112-113

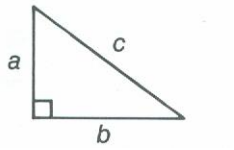
SOLUTIONS

1. State the length of the hypotenuse.



c = 12.5	c = $5\sqrt{2}$

3. For the triangle, find the value of c.



a) a = 5, b = 12 b) a = 8, b = 15 c) a = 15, b = 20

$c^2 = a^2 + b^2$ $c^2 = (5)^2 + (12)^2$ $c^2 = 25 + 144$ $c^2 = 169$ $c = \sqrt{169}$ c = 13	$c^2 = a^2 + b^2$ $c^2 = (8)^2 + (15)^2$ $c^2 = 64 + 225$ $c^2 = 289$ $c = \sqrt{289}$ c = 17	$c^2 = a^2 + b^2$ $c^2 = (15)^2 + (20)^2$ $c^2 = 225 + 400$ $c^2 = 625$ $c = \sqrt{625}$ c = 25

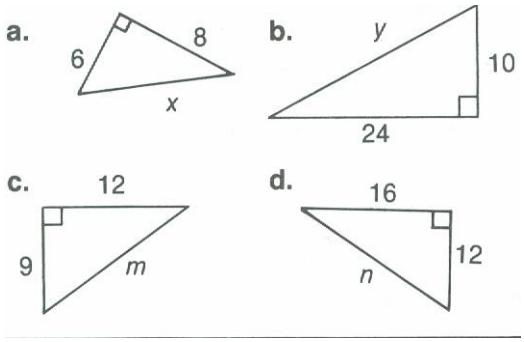
4. For the right-angled triangle with hypotenuse t, find the value.

a) of r, if s = 15 and t = 39
b) of u, if v = 30 and t = 34
c) of y, if t = 30 and z = 18

$r^2 = t^2 - s^2$ $r^2 = (39)^2 + (15)^2$ $r^2 = 1521 - 225$ $r^2 = 1296$	$u^2 = t^2 - v^2$ $u^2 = (34)^2 + (30)^2$ $u^2 = 1156 - 900$ $u^2 = 256$	$y^2 = t^2 - z^2$ $y^2 = (30)^2 + (18)^2$ $y^2 = 900 - 324$ $y^2 = 576$

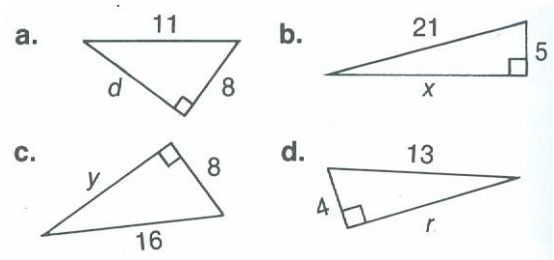
$r = \sqrt{1296}$ $r = 36$	$u = \sqrt{256}$ $u = 16$	$y = \sqrt{576}$ $y = 24$

5. Find the unknown length of the side.



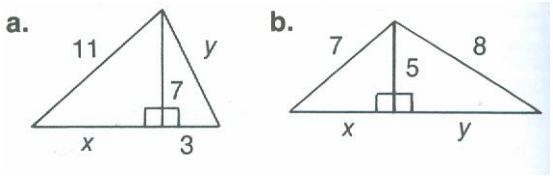
$c^2 = a^2 + b^2$ $x^2 = (8)^2 + (6)^2$ $x^2 = 64 + 36$ $x^2 = 100$ $x = \sqrt{100}$ $x = 10$	$c^2 = a^2 + b^2$ $y^2 = (10)^2 + (24)^2$ $y^2 = 100 + 576$ $y^2 = 676$ $y = \sqrt{676}$ $y = 26$	$c^2 = a^2 + b^2$ $m^2 = (12)^2 + (9)^2$ $m^2 = 144 + 81$ $m^2 = 225$ $m = \sqrt{225}$ $m = 15$	$c^2 = a^2 + b^2$ $n^2 = (16)^2 + (12)^2$ $n^2 = 256 + 144$ $n^2 = 400$ $n = \sqrt{400}$ $n = 20$

7. Find the unknown length of the side to one decimal place.



$a^2 = c^2 - b^2$ $d^2 = (11)^2 + (8)^2$ $d^2 = 121 - 64$ $d^2 = 57$ $d = \sqrt{57}$ $d = 7.5$	$a^2 = c^2 - b^2$ $x^2 = (21)^2 + (5)^2$ $x^2 = 441 - 25$ $x^2 = 416$ $x = \sqrt{416}$ $x = 20.4$	$a^2 = c^2 - b^2$ $y^2 = (16)^2 + (8)^2$ $y^2 = 256 - 64$ $y^2 = 192$ $y = \sqrt{192}$ $y = 13.9$	$a^2 = c^2 - b^2$ $r^2 = (13)^2 + (4)^2$ $r^2 = 169 - 16$ $r^2 = 153$ $r = \sqrt{153}$ $r = 12.4$

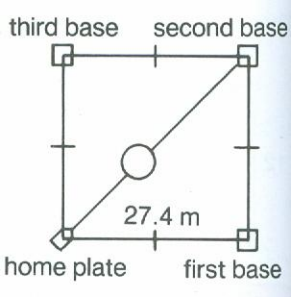
8. Find the unknown lengths of the sides to one decimal place.



$a^2 = c^2 - b^2$	$c^2 = a^2 + b^2$	$a^2 = c^2 - b^2$	$a^2 = c^2 - b^2$
$x^2 = (11)^2 - (7)^2$	$y^2 = (7)^2 + (3)^2$	$x^2 = (7)^2 - (5)^2$	$y^2 = (8)^2 - (5)^2$
$x^2 = 121 - 49$	$y^2 = 49 + 9$	$x^2 = 49 - 25$	$y^2 = 64 - 25$
$x^2 = 72$	$y^2 = 58$	$x^2 = 24$	$y^2 = 39$
$x = \sqrt{72}$	$y = \sqrt{58}$	$x = \sqrt{24}$	$y = \sqrt{39}$
$x = 8.5$	$y = 7.6$	$x = 4.9$	$y = 6.2$

9. What straight-line distance does a ball travel if it is thrown from second base to home plate? Write the distance to one decimal place.

$c^2 = a^2 + b^2$
$x^2 = (27.4)^2 + (27.4)^2$
$x^2 = 750.76 + 750.76$
$x^2 = 1501.52$
$x = \sqrt{1501.52}$
$x = 38.7$ m



10. An outfielder catches the ball on the first base line about 12 m behind first base. To the nearest tenth of a metre, what straight-line distance does the ball travel if the ball is thrown to the player?

a) at second base b) at third base

$c^2 = a^2 + b^2$ $x^2 = (27.4)^2 + (12)^2$ $x^2 = 750.76 + 144$ $x^2 = 894.76$ $x = \sqrt{894.76}$ $x = 29.9$ m	$c^2 = a^2 + b^2$ $x^2 = (39.4)^2 + (27.4)^2$ $x^2 = 1552.36 + 750.76$ $x^2 = 2303.12$ $x = \sqrt{2303.12}$ $x = 48.0$ m

11. Will a 25 cm long microphone lie flat on the bottom of a box measuring 14 cm by 20 cm? Explain.

$c^2 = a^2 + b^2$
$(25)^2 = (14)^2 + (20)^2$
$625 = 196 + 400$
$625 = 596$

The wire will not lay straight because the 3 numbers are not a Pythagoras Triple. Meaning the right side does not equal the left side.

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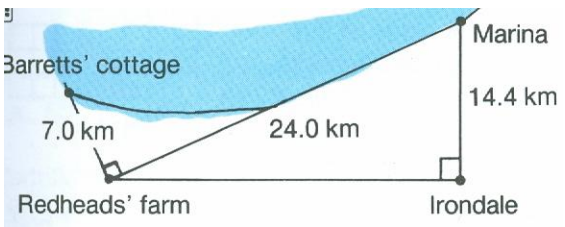
12. a) How far is it by boat from the Barretts' cottage to the Marina?

b) How long is the shortest route by road from the Barretts' cottage to Irondale?

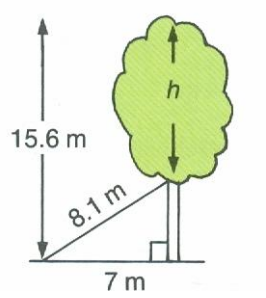


$c^2 = a^2 + b^2$ $c^2 = (7)^2 + (24)^2$ $c^2 = 49 + 576$ $c^2 = 625$ $c = \sqrt{625}$ c= 25 km	$a^2 = c^2 - b^2$ $a^2 = (24)^2 - (14.4)^2$ $a^2 = 576 - 207.36$ $a^2 = 368.64$ $a = \sqrt{368.64}$ a= 19.2 km 19.2 + 7 = 26.2 km

13. To support the tree a guy wire 8.1 m long is attached to the trunk and then secured in the ground. Find "h" to the nearest tenth of a metre.

$a^2 = c^2 - b^2$
$a^2 = (8.1)^2 - (7)^2$
$a^2 = 65.61 - 49$
$a^2 = 16.61$
$a = \sqrt{16.61}$
a= 4.1 m

15.6 – 4.1 = h
11.5 = h



14. A 12m guy wire is attached to the top of a flagpole and secured in the ground 5 m from the base of the flagpole. How tall is the flagpole, to the nearest tenth of a metre?

$a^2 = c^2 - b^2$
$a^2 = (12)^2 - (5)^2$
$a^2 = 144 - 25$
$a^2 = 119$
$a = \sqrt{119}$
a= 10.9 m

The flagpole is 10.9 m tall.

15. How far up a wall will a 7 m ladder reach if the foot of the ladder is 2 m from the wall?

$a^2 = c^2 - b^2$
$a^2 = (7)^2 - (2)^2$
$a^2 = 49 - 4$
$a^2 = 45$
$a = \sqrt{45}$
a= 6.7 m

The ladder will go up the wall 6.7 m.

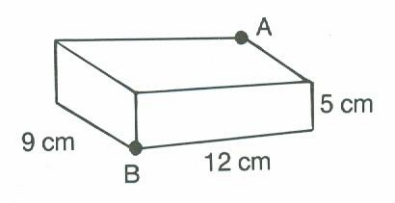
16. A Pythagorean triple is a set of three natural numbers that represent the lengths of the sides of a right-angles triangle. Is the set a Pythagorean triple?

a) 8, 15, 17 b) 12, 16, 25 c) 48, 56, 72d) 19, 27, 35

e) 33, 44, 55 f) 54, 72, 90

$c^2 = a^2 + b^2$ $(17)^2 = (8)^2 + (15)^2$ 289 = 64 + 225 289 = 289 **YES**	$c^2 = a^2 + b^2$ $(25)^2 = (12)^2 + (16)^2$ 225 = 144 + 256 225 = 400 **NO**	$c^2 = a^2 + b^2$ $(72)^2 = (48)^2 + (56)^2$ 5184 = 2304 + 3136 5184 = 5440 **NO**
$c^2 = a^2 + b^2$ $(35)^2 = (19)^2 + (27)^2$ 1225 = 361 + 729 1225 = 1090 **NO**	$c^2 = a^2 + b^2$ $(55)^2 = (33)^2 + (44)^2$ 3025 = 1089 + 1936 3025= 3025 **YES**	$c^2 = a^2 + b^2$ $(90)^2 = (72)^2 + (54)^2$ 8100 = 5184 + 2916 8100 = 8100 **YES**

17. An ant sits at point A on a rectangular food container. Find the length of a path that the ant can walk on the container from A to B.

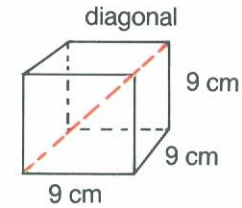


$c^2 = a^2 + b^2$
$AB^2 = (9)^2 + (12)^2$
$AB^2 = 81 + 144$
$AB^2 = 225$
$AB = \sqrt{225}$
$AB = 15$

15 plus 5 to get to top.

The length of the path is 20 cm.

18. Find the length of the diagonal of the cube to one decimal place.



First find the diagonal at the bottom of the square.
$c^2 = a^2 + b^2$
$c^2 = (9)^2 + (9)^2$
$c^2 = 81 + 81$
$c^2 = 162$
$c = \sqrt{162}$
$c = 12.7$

Then use that information to help you find the slope of the big diagonal.
$c^2 = a^2 + b^2$

$c^2 = (12.7)^2 + (9)^2$
$c^2 = 162 + 81$
$c^2 = 243$
$c = \sqrt{243}$
$c = 15.6$

The length the long diagonal is 15.6 cm.